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Heat Flux on the Bore-Face and Temperature Distribution in the Formation

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Abstract

The temperature field in the formation disturbed by the heat flow from the borehole is modeled by the heat conduction equation and thermal interaction of the circulating fluid with formation is approximated by the Newton relationship on the boreface. The problem is solved analytically by the heat balance integral method, where the radius of thermal influence is determined implicitly by the algebraic equation. On the basis of this solution a new approximate formulae for the heat flux on the bore-face and temperature in the formation are proposed. The solution accounts for the thermal history of the formation temperature and possible axial variation of generally unsteady temperature in the borehole. The correctness of the approximate solution is validated by comparison with an exact analytical solution found by Carslaw and Jaeger.

Keywords

Approximate solution, Bore-face, Borehole, Heat flux, Temperature field